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Destroying Coffee Harvests, One Field at a Time: The Impact and Implications of Roya

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Abstract

Unión MicroFinanza (UMF) is a nonprofit organization in La Unión, Lempira, Honduras that provides microfinance and refinance services to coffee farmers. To achieve the goal of improving rural communities and local conditions, UMF runs agricultural training programs, organizes community development projects, and purchases coffee beans from farmers for export to the United States. In the 2012-2013 season, their chief concern was “roya,” a coffee leaf rust. To evaluate roya’s devastating impact on local farmers, three studies, detailed in this paper, were completed. First, self-reported data was gathered from 104 farmer applications to assess coffee conditions and specific situations farmers faced. Second, harvest amounts were gathered from these farmers to compare changes between two consecutive seasons. Third, six qualitative interviews were conducted to better understand the farmers’ lifestyle habits and hardships. Results indicated that roya had a widespread effect on 80% of the community, with a minimum of three years before fields would fully be recovered. Almost all farmers were not educated about roya prior to or during the epidemic, and most are still undergoing training. Finally, like any portfolio or financial analysis that involves risk, diversification plays an important role in making decisions. These factors play a key role in assessing how what actions should be taken to drive improvement in La Unión.

Keywords

coffee, agriculture, Honduras, roya

Disciplines

Business



Destroying Coffee Harvests, One Field at a Time: The Impact and Implications of Royia

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I. Abstract

Unión MicroFinanza (UMF) is a nonprofit organization in La Unión, Lempira, Honduras that provides microfinance and refinance services to coffee farmers. To achieve the goal of improving rural communities and local conditions, UMF runs agricultural training programs, organizes community development projects, and purchases coffee beans from farmers for export to the United States. In the 2012-2013 season, their chief concern was “roya,” a coffee leaf rust. To evaluate roya’s devastating impact on local farmers, three studies, detailed in this paper, were completed. First, self-reported data was gathered from 104 farmer applications to assess coffee conditions and specific situations farmers faced. Second, harvest amounts were gathered from these farmers to compare changes between two consecutive seasons. Third, six qualitative interviews were conducted to better understand the farmers’ lifestyle habits and hardships. Results indicated that roya had a widespread effect on 80% of the community, with a minimum of three years before fields would fully be recovered. Almost all farmers were not educated about roya prior to or during the epidemic, and most are still undergoing training. Finally, like any portfolio or financial analysis that involves risk, diversification plays an important role in making decisions. These factors play a key role in assessing how what actions should be taken to drive improvement in La Unión.

II. Introduction

Coffee is Honduras' most important cash crop, alone accounting for 47 percent of the country's agricultural exports.¹ The first signs of coffee production in Honduras had been documented in 1804, but major cultivation for worldwide export began in the late nineteenth century.² Over the next century, the country had expanded coffee production to 16 of its 18 states, reaching 213 out of the 298 municipalities.³ Globally now, Honduras is the largest producer of coffee in Central America and the seventh largest worldwide by volume. Within the country, more than 85,000 small producers—farmers who sell less than 77 bags each—collectively grow more than 90 percent of all coffee production in Honduras.

Specifically for Unión Microfinanza, a young, 501(c)(3) nonprofit organization, coffee is very important to small-scale farmers in the municipality of La Unión, a region in Lempira, one of Honduras' most impoverished states. There, coffee is the main cash crop grown by farmers. Corn and beans are the next most common produce but are typically grown to feed the family rather than sold for income. For this reason, La Unión farmers place huge emphasis on the opportunity to produce and sell coffee beans in order to bring their families beyond subsistence farming. However, although coffee harvests have generally increased over the past several years in Honduras, this year has been different. In all of Central America, coffee plants were affected by roya, a form of leaf rust that drastically devastated farmers' harvests and incomes. The disease was highly prevalent in nearly all coffee farms, referred to as "fincas," in and around La Unión. This past year, Unión Microfinanza has been working on methods to improve the coffee industry in La Unión and help farmers overcome the leaf rust epidemic.

Although UMF was only officially established in 2009, the organization is now active in 21 villages surrounding La Unión. In the first of two seasons this year, UMF distributed over \$24,000 worth of microloans in the form of agricultural supplies, such as fertilizer and processing equipment. Beyond that, the organization purchased over 38,000 pounds of coffee from La Unión farmers between 2011 and 2012, and sold it to various specialty coffee distributors and consumers in the United States.⁴ The organization hopes to eventually build a self-sustainable business model by funneling one hundred percent of its coffee sale profits back into the organization's Honduras operations.

However, as mentioned previously, Unión Microfinanza has faced many challenges from roya; most, if not all, of UMF's clients (which constitute most of the community) fear to find out exactly how many crops they have lost, how much more they will lose and how long it will take for their fincas to recover. This study therefore attempts to measure both the quantitative and qualitative impacts of roya, which UMF can use in moving forward.

The project consisted of three main intentions:

- 1) Analyze self-reported data from client applications to evaluate farmers' current situations.*
- 2) Compare coffee harvests between 2011 and 2012 to calculate roya's toll on fincas.*
- 3) Understand lifestyle changes and hardships for roya-inflicted farmers through personal interviews and discussion.*

The project also required strong background knowledge of roya and thorough research of the topic, which will be discussed in the following section. These initial steps consisted of online research, lessons from agricultural experts, and hands-on demonstrations. The project's overall data includes both quantitative and qualitative analysis to capture a comprehensive understanding of how roya has impacted the farmers of La Unión. Although this is a preliminary study of the coffee leaf rust epidemic, it provides Unión MicroFinanza and its clients with a specific, numerical, and up-to-date breakdown.

III. Background

History of Roya

In order to interpret the results of this research project, it is important to understand what roya really is. This fungus first appeared in Sri Lanka during the latter half of the 19th century, causing great damage to coffee productivity and forcing farmers to replant with tea. It spread to areas in southern India and to other warm, moist coffee growing lands in Southeast Asia. Interestingly enough, coffee plants grown at higher altitudes were not—if at all—affected by roya. Likewise, shade, heat, care, and several other factors play a role in how roya develops and its effect on coffee harvests. As a result, it is impossible to pinpoint one single reason for the recent roya outbreak, and even more difficult to provide one general recommendation for all farmers. Depending on the condition of the finca, each farmer must take different measures on his or her field. Although roya had been present in coffee plants since the 19th century, it affected Central America's coffee industry like never before this past year.

How to Identify Roya

The first observable signs of roya are small, pale yellow spots on the upper surface of coffee leaves. As these spots grow in diameter, orange uredospores appear under the leaves and form a layer of powder; the fungus then sporulates through the stomata, unlike most rusts which break through the epidermis.

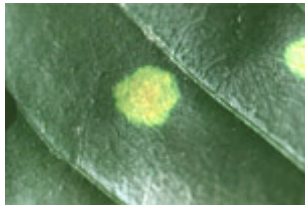


Figure 1



Figure 2



Figure 3

The stages of roya depicted on coffee leaves⁵

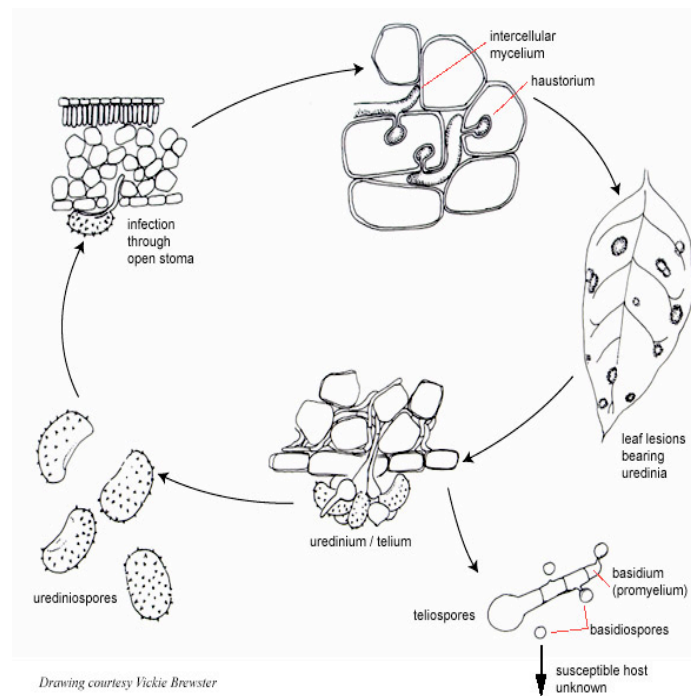
The lesions tend to develop around the margins where dew and raindrops normally collect. The centers of the spots become dry and brown. The infection typically progresses from lower leaves early in the season to upper leaves of the tree as time passes. Most infected leaves drop prematurely and leave long expanses of twigs bare of any leaves or nutrition. As a result, the coffee plant is not able to bear any fruits, and there is no harvest for the year. Because the whole process of infection requires 24 to 48 hours of continuous free moisture, infection usually occurs during the rainy season. The major effect of coffee rust is the premature shedding of leaves, which affects any photosynthetic capacity of the plant. This restricts the growth of new stems for the next season. As a result, disease severity in one year directly impacts the harvest amount the following year; in serious cases of roya, the disease can have a debilitating effect on the plant over successive seasons and destroy potential harvests.



Figure 4

Underside of coffee leaf with yellow spots and orange powder

Specifically, roya is most severe on Arabica coffee growing at lower altitudes (below 1,500 m). Here, warmer temperatures permit greater levels of infection during wet periods. Heavily bearing trees or branches are also more susceptible to roya. However, rust severity is typically known to be less severe in shaded areas; this may be related to coffee yield levels since fully exposed coffee produces higher yields but is more susceptible to rust. In either case, the farmers are at a loss between choosing having plants affected by roya or having plants with low yields. Moreover, there are several other diseases and deficiencies besides roya that typically affect coffee plants—which producers are likewise forced to deal with.



The above diagram depicts the typical life cycle of the disease

Note: The purpose of this study is not to examine the biological nature of roya, but rather to analyze and understand the impact it has had on the community. The rest of the paper will discuss the data gathered, the process of gathering this data, conclusions drawn, and further steps to be taken.

IV. Methodology

It was common knowledge that roya had reduced harvests immensely and left many with little income, scarce food, and almost no hope, but none of UMF's clients—nor UMF—knew exactly how much was lost. There have been many predictions regarding the amount of coffee harvest decrease in Central America, but no reports were calculated for each specific county or community. The International Coffee Organization (ICO) did estimate that expected crop losses in Central America would total “\$500 million and cost 374,000 jobs” prior to the end-of-season tally. Rather than leave these numbers ambiguous for UMF, this research provides a close-up analysis of roya-related impacts in La Unión, Honduras. The specific methods in gathering this data are described in detail below:

Data collection

Information was gathered from multiple sources in different forms to calculate the extent to which farmers were affected by roya. The data revolved around the project's three main intentions through quantitative and qualitative analysis. Of course, all data collection in La Unión took place after thorough research of roya was completed both online and in person with experts.

Self-Reported Data from Client Applications (2011-2012 Season)

Primary analysis was completed from client applications that were filled out for this past season. Comparisons were then made with previous season's applications, and the data was graphed and categorized. The first section of data included the farmer's name, the location of their aldea(s), which crops were produced, types of coffee varietals, and size of the finca. This information served to provide basic background and situational analysis to better understand each farmer's conditions. The second section of data focused on roya, specifically whether farmers had signs of roya (Yes/No), the amount of finca affected (if at all), their access to information, any action taken, and potential plans for the future. These application reports formed the basis of this research project.

Coffee Harvest Amounts between 2012 and 2013

Second, data was gathered from clients' financial statements for each coffee-producing village, which amounted to 19 of the 21 villages. The other two communities focused on harvesting corn and beans, although most of these farmers were also coffee bean pickers, attempting to earn some “extra” money for their families. In general, the data included harvest amounts, which were adjusted for measurement differences, and the price at which farmers sold each unit. Typical units were reported in either *Carga*, *Galon Uva* (Gallon Dry), *Galon Lavado* (Gallon Washed), *QQ P/S*, or *QQ Oro*. The price each farmer sold their coffee to UMF for was recorded in *Lempiras*. The two values were multiplied to determine the amount each farmer earned.

Personal Interviews and Quantitative Discussions

Third, personal interviews and several group discussions were conducted to gain a deeper understanding of the farmers' lives. Some topics that were addressed include impact on

family life, change in yearly spending, current and future concerns, community reactions, and feedback for UMF.

Hands-on data was also collected after visits to several villages and fincas. Experts and farm owners provided demonstrations, led training sessions, and completed statistical experiments and analysis, which will be discussed later on.

Data Processing

All data was processed through Microsoft Excel 2008 and JMP 10 Software. To analyze the self-reported data, information was input into Excel and categorized respectively. Bar graphs, tables, and proportions were plotted to serve as comparisons and visual aids.

Steps

First, the farmers were split by location of their coffee farms. This helped identify whether some areas fared better than others from the roya attack. Next, the number of farmers producing each type of crop and coffee varietal were recorded on graphs and analyzed through JMP software. Similarly, the amount of each variety produced was plotted to compare popularity of coffee type and whether that has changed since the roya epidemic.

Specifically, for the analysis of roya, the percentage of farmers who were affected and the estimated amount of coffee affected per farmer were recorded. Many did not have access to the necessary information to take action against the leaf rust, but several did have plans for the future; this conditional information was taken into account.

Interviews were conducted with various farmers, both male and female, and in different locations around town. Most lasted half an hour and were recorded for reference later on. Assistance was provided by three Honduran employees to overcome language barriers and gather more accurate data. The template of questions (in both English and Spanish) are included in the Appendix section. Potential issues and improvements regarding data collection are discussed in the Conclusions and Future Research section.

For studies that took place on coffee farms, several tactics and procedures were used. Training programs, for example, evaluated both roya and nutritional deficiencies; they included random samples of 100 leaves, instructions on identifying specific diseases, and recommendations from UMF's Honduran officers. Farmers were provided with *libretas* (booklets) to record relevant deficiencies, frequency of occurrences, and potential solutions and plans for the upcoming year. They are also responsible for updating these booklets throughout the season in order to track data and status of their fincas. Other visits incorporated more hands-on activities, such as showing farmers how to prune plants with machetes and how to pick the right plants to uproot.

V. Results and Discussion

A. Self-Reported Data from Client Applications (2011-2012 Season)

Nearly 80% of UMF's coffee clients in the La Unión area were affected by roya during the 2011 – 2012 season. Although the proportion of *total* farmers affected was smaller (70%), since it included separate bean and corn farmers with no coffee plants, it is still a very high share of the whole community and disconcerting news for UMF. This essentially means that 70% of the community lost their main source of income, taking a big hit to the local economy. Regarding the 20% of coffee farmers who were not affected, 17 out of these 19 farmers had almost all Lempira, a roya-resistant variety. Many of these farmers relied on other sources of income, so their fincas tended to be smaller and less diversified. The specific breakdown can be seen in **Table 1** below.

<u>Roya Cases</u>	<u># of Total Farmers</u>	<u>% of Total Farmers Affected by Roya</u>	<u># of Total Coffee Farmers</u>	<u>% of Coffee Farmers Affected by Roya</u>
73	104	70.19%	92	79.35%

Table 1: Reported above is the number of farmers affected by roya, as well as the proportion in regards to the total number of farmers and the total number coffee farmers. Total farmers include all coffee, bean, and corn farmers.

Yet, how is it possible that 80% of total farmers in the nineteen villages were affected by roya? Why was the proportion so high? One reason, as the project results revealed, was because of lack of information that caused very few farmers to take proactive action. According to the self-reported data as seen in **Chart 1**, only 22% of the 104 farmers received any previous information regarding roya. This varied from radio sources, word-of-mouth, brochures, and training programs through IHCAFE. Furthermore, even amongst the 22%, their knowledge was very limited. Most mentioned on their applications that they have only heard the term “roya” and its devastating effects, not concrete solutions for treating the leaf rust. For the very few who did receive sufficient information, they did not have the resources or money to take preemptive measures.

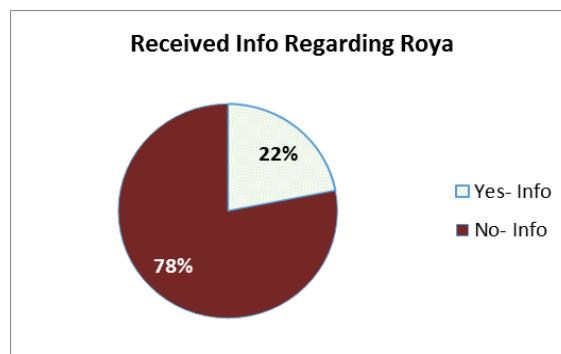
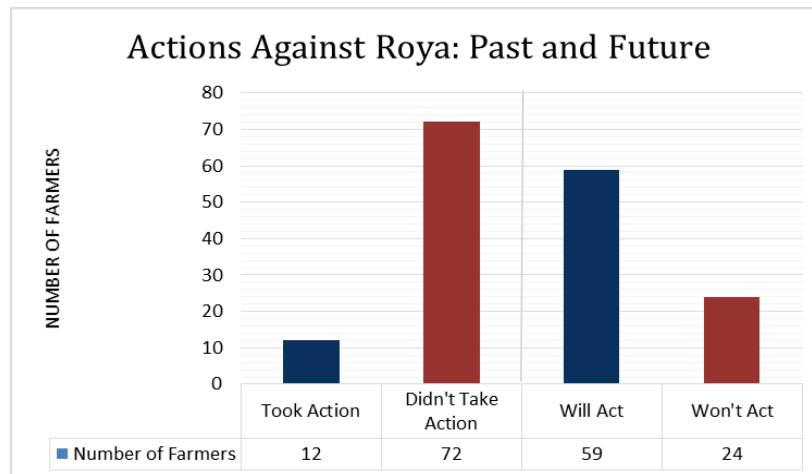


Chart 1: The percentage of farmers who received any information regarding roya.

Since roya was unexpected, it makes sense that so few farmers were prepared. However, even after their harvests were destroyed, farmers were not cognizant of treatment methods or any specifics regarding how their plants were affected. As a result, very few farmers took action this past year. Of those who did take action, most had been affected very early on compared to the rest of the community and had already suffered major losses. Because of their early exposure, they acted quickly. Specifically, the villages of El Filo and El Sitio took the best proactive action against roya (through fumigation techniques), possibly because both had some of the highest rates of roya-affected harvest to begin with. **Graph 1** depicts that although 14% of farmers did not take action, 71% do plan on acting this upcoming year. These actions include fumigating, fertilizing, and replanting, which are the common practices against roya.

Of the 24 who claimed that they will *not* act, four of them did not have roya, and the rest had the rust-resistant Lempira variety. Thus, they have no need to take other measures against the leaf rust. Accordingly, all who were affected had decided the need to take action in the near future; if they do not, then there will be no harvests, which means no income and no way of surviving. There appears to be one person who did not indicate future plans. Some potential reasons for this may be that he transitioned to complete bean and corn farming, did not think he would be able to afford any reasonable action, or simply was not sure what to do.

As a result, UMF has been working towards providing farmers with more information and opportunities to gradually overcome the roya epidemic. Now, most farmers understand what roya is, and they are working on reviving their fields. Several were able to fertilize their fields this year because of UMF's micro financing program and have enrolled in a monthly pay back program. Their ability to attend meetings and pay off monthly debt are two of several factors taken into calculation when determining how much fertilizer each farmer qualifies for. The idea is that once farmers treat their fields and overcome the damage from roya, they will be able to become self-sustaining once again and continue a healthy relationship with UMF.



Graph 1: Comparison of past and future actions against roya.

According to the farmer applications, roya plagued 40% of planted manzanas, a unit of measurement similar to the acre, in the 19 villages. Because this percentage was calculated from self-reported data, further research was conducted from hard data to evaluate accuracy, which will be discussed in the last part of the results section.

It must also be highlighted that the actual impact was much greater than 40% because in the same period, prices fell, quality of coffee decreased, and living conditions were very poor. It will take at least two to three years to prune and grow the coffee plants back to their original condition.

Coffee Varieties and their Relation to Roya: Analyzing Plant Diversification

Another important aspect to consider was the type of coffee that farmers planted. How much variety did each family and each village own? Was there a relationship between coffee type and amount affected? These were clear concerns UMF had; if they did find a correlation, then they could provide solutions immediately. This question of diversification posed a difficult situation for farmers to begin with—should they plant more of the resistant variety to ensure less risk of roya infection but give up better-quality coffee, or should they diversify their plants with the possibility of having part of their finca affected by roya yet have “better tasting” yields? There is no determinate answer to this question, as it depends on several factors, including the farmer’s preference, his or her income level, and the willingness to take risk. However, UMF has been working on advising individual farmers to help them choose the best option for the next few years.

As seen in **Chart 2**, Lempira (34%) appeared most in farmer applications, followed by Catuai (20%) and noventa/90 (19%). Proportions were calculated based on frequency. Several farmers also owned more than one type. Although Lempira is lower quality, it was quickly replacing Catuai because of its resistant genes.

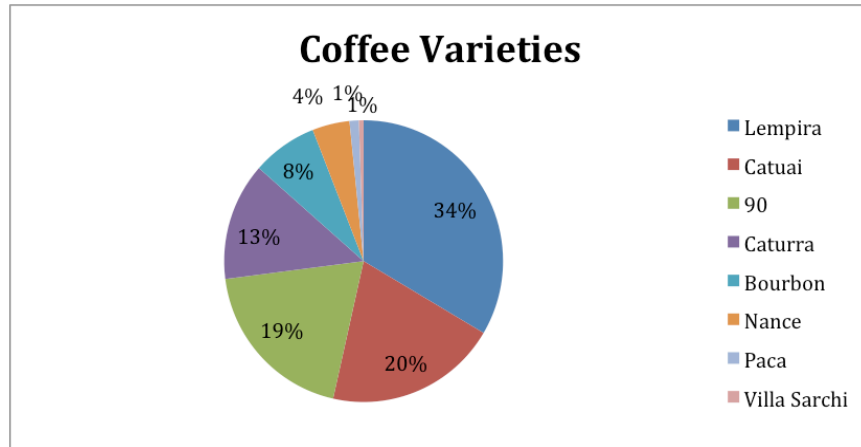
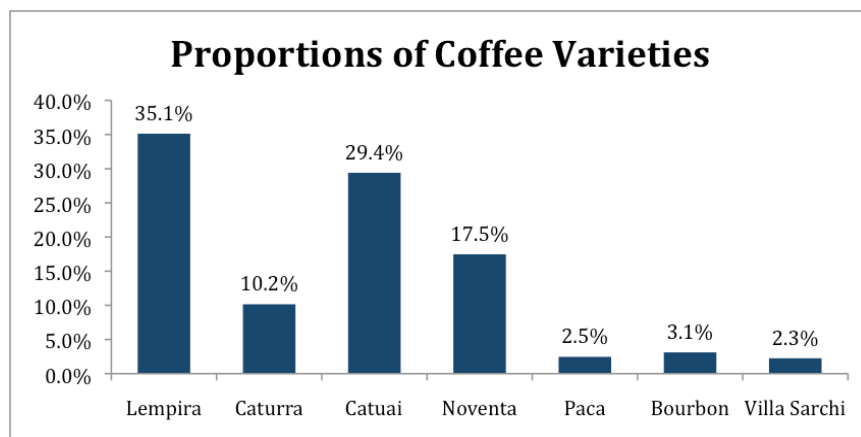


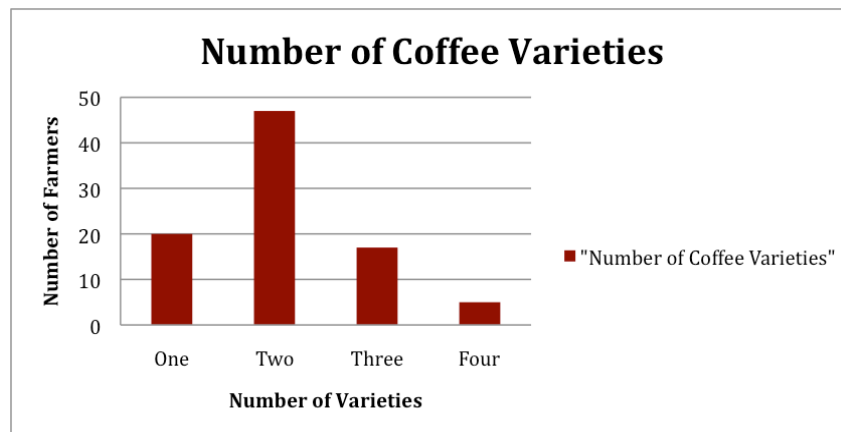
Chart 2: Proportion of Coffee Varietals by frequency

Then, to determine the true proportions of coffee varieties, data from the applications were analyzed. In contrast to Chart 2, **Graph 2** below shows the amount of each variety based on number of manzanas. Again, Lempira was the highest percentage, at 62 manzanas, which is 35.1% of the total farmland reported. Interestingly, although Villa Sarchi was only mentioned once in the application and not commonly found in the region, the owner had a substantial amount (2.75 manzanas). For clarification, noventa is the same as 90. It is important to note that many farmers had combinations of Lempira and Catuai, as well as Lempira and 90, but these combinations were not taken into account in Graph 2 because farmers did not specify proportions of each when reporting them together. Thus, the amount of Lempira is actually greater than the reported 35%. Unfortunately, this indicates that most farmers are switching to Lempira to become their sole crop in order to avoid roya. However, this is not the safest or wisest decision. It is better to diversify because each variety has its strengths and weaknesses. For example, although Lempira is resistant to coffee leaf rust, it is susceptible to other pests and nutritional deficiencies and bears lower-quality coffee beans. As in finance, a diversified portfolio yields higher returns.



Graph 2: Proportion of Coffee Varietals calculated by amount of manzanas

To examine exactly how many farmers were diversifying their fincas, the exact number of coffee varieties held by each farmer was analyzed from their applications. **Graph 3** shows that 47 farmers, or 53%, held two forms of coffee, and 20 farmers, or 22%, held only one variety. Although having more types tends to produce more coffee, more consistency, and better results overall, it may also be that wealthier individuals were able to afford planting more to begin with. Further research will have to be made in order to examine this question in more detail.



Graph 3: Number of Coffee Varieties owned by farmers

B. 2011 and 2012 Coffee Harvests Gathered from Annual Income Statements

The next step was to analyze coffee harvests from the clients' annual income statements; these constituted farmers who sold their coffee beans to UMF directly. Data was categorized by aldea so comparisons could be made to see if there were any villages that did particularly well or particularly poorly. This process was completed for both the 2011 and 2012 seasons to compare the change before and after roya hit.

Results indicate that the majority of aldeas fared much worse in 2012. The season's harvests (in Cargas) and price received per unit were compared. Overall, 11 of the 19 coffee aldeas had clients that no longer enrolled and "dropped," potentially because they didn't have any coffee to sell or decided to rely on other methods for income. Coffee harvests for 3 farmers actually fell to zero Cargas, and many others were close to zero. Although some aldeas had averaged higher harvests or prices in the 2012 season, it was because the aldea was very small and had one farmer who did particularly well and brought the average up. This was not indicative of most villages. To illustrate an example of how badly certain farmers were affected, **Figure 5** depicts Ceibita Abajo's harvests and prices in 2011 and 2012. The village experienced a 45% decrease in coffee harvested and a 44% decrease in price received for the coffee. As income is calculated by multiplying harvest amount and the price at which it is sold (whether to UMF or another party), the farmers were hurt two-fold. This data put exact numbers to what farmers and UMF employees had feared all along.

<u>Ceibita Abajo</u>	
•	2012 harvest: 17.44 Cargas (average)
•	2013 harvest: 9.56 Cargas (average)
•	2012 prices: 2,750 L
•	2013 prices: 1,531.25 L
•	45.18% decrease in harvest
•	44.32% decrease in price

Figure 5: Harvest Data and Prices for Ceibita Abajo in 2011 and 2012 (average of all farmers)

C. Qualitative Analysis: Data-Processing Through Personal Interviews

Qualitative analysis from personal interviews served to supplement the quantitative findings and provide deeper insight. In total, six formal interviews were conducted with various farmers to evaluate the impact of roya on their fincas, harvests, and personal lifestyles. Honduran employees from UMF accompanied and facilitated each interview to ensure that questions and responses were interpreted clearly and accurately. Each interview was recorded on audio for later reference; the questions are provided in both English and Spanish in the **Appendix** below.

Although each farmer interviewed came from different backgrounds, they experienced similar effects and suffered greatly from the coffee leaf rust. For example, one farmer reported that her coffee harvests were reduced from 110 quintales (where 1 quintal is equivalent to approximately 100 pounds) to 70 quintales. Her family will not be able to finish house constructions or improvements and will likewise face many other financial challenges. Currently, they operate a “pulperia,” selling shoes and apparel, as another source of income. Many other farmers and coffee producers work as elementary teachers in order to support their whole family. Especially during this period of difficulty, a second job provides a steadier, albeit insufficient, stream of income.

Despite the difficulties and obstacles posed by roya, farmers repeatedly convey that UMF has provided a lot of assistance and help. Most farmers did not know they had such high-quality coffee until UMF started cupping their coffee and harvests. The organization also offers higher prices—at almost double the market price—for this quality coffee; as a result, farmers take more care to separate bad harvests from good, whereas it did not matter to them before. It was also evident that most farmers wanted and needed training. Their primary source of information was through interaction with other farmers. They also did not understand the importance of pruning their coffee plants, letting their fields over-grow and crowd out.

VI. Conclusions, Limitations, and Future Recommendations and Research

All of the data and results admittedly reveal that this was a bad year for coffee farmers in Central America. Unfortunately, once coffee plants are affected or diseased, time is needed for them to recover, which generates an enormous lag. Taking the effort to learn about how best to recuperate the finca is the ideal route for farmers in La Unión. Throughout this process, it will be important for these farmers to realize that constant and careful examination of coffee plants throughout each acre will help decrease, though not necessarily prevent, future damage. Even though a finca may bear green leaves and seem healthy from afar, farmers must look at the undersides and veins of the leaves. In learning from and working with a wide range of experts, UMF's Honduran employees (who run the training program amongst other duties) should calculate the cost for each of the methods used to recover from roya, such as cutting, pruning, and fumigating. Individual farmers can then decide which method to use based on their situation, income, and time needed for recovery. By him or herself, the typical La Unión farmer will not be able to sufficiently or aptly combat "epidemics" like roya.

There are also several other fungi, diseases, and deficiencies beyond roya. Participation in the training program that UMF offers will help farmers learn about and prevent them. Because farmers are required to document their fincas and take samples of 100 leaves every month in this particular program, it keeps track of the health of their fields. Involvement is voluntary for farmers, but it is crucial that they realize the need for the training. Depending on where the fincas are and what type of environment they are in (i.e. on a steep slope, facing the sun, in the shade, etc.), various fincas may be best suited for various coffee varieties and treatments. Merely sharing ideas or talking to nearby farmers will not be adequate. It will be useful to compile a small brochure of recommendations as well as tips on diversification. Since most of the farmers in and around La Unión do not have access to a lot of information, this is their main source of coffee education.

One of the key concerns drawn from this research experience centers on life in the United States. Close to all casual coffee drinkers have no knowledge of how coffee is grown, the complete supply chain process, or the current news in this field. A potential goal is to partner UMF with Wharton's Social Impact club to educate and expose the greater population to where coffee really comes from. This will help establish relationships, which is one of the key goals of UMF.

Although this preliminary research provides deeper insight, it has several limitations. The information gathered and respective conclusions are specific to coffee-producing farmers in Honduras, in particular the surrounding villages of La Unión. The methods used by this region and the given conditions (that are fixed) may differ compared to other coffee-producing areas. Furthermore, a portion of the data was self-reported by farmers and may not be as accurate. Their estimates provide general guesses. In fact, it has been very difficult in the past to gather precise data due to their lack of development and different business methods. As technology improves and is integrated in daily work, data collection will become much more manageable and accurate. UMF has been working on

transferring all their paperwork into digital format and utilizing more of the recent technology. However, they are limited in nature by the lack of stable Internet and frequent electricity outages in Honduras.

Moving forward, further research should be conducted. Farmers would benefit from the data and be able to implement plans to generate better harvests. Although this project has had informative and critical value for La Unión, there is no limit to what can be done to help the community. Potential research topics may vary from science-oriented topics to a closer look into the business and supply chain of the coffee industry.

For more information about Unión Microfinanza, their blog provides ongoing updates, news features, and a glimpse into coffee as well as life in Honduras: <http://blog.unionmicrofinanza.org/>.

Appendix

English / Spanish

Name/ nombre:

Age/ edad:

Village/ aldea:

How long have you owned your finca?

Por cuánto tiempo ha tenido su finca?

What types of crops do you grow? Which do you actually sell as cash crop?

Que produce Usted? Cual productos vende a otras personas? Produce algo que solo usa su familia?

Coffee Varieties:

Do you have another source of income besides farming? If so, what is it and how stable is it?

¿Tiene otra fuente de ingreso además? ¿Qué? ¿Es seguro?

Have you encountered any crop diseases before the recent roya attack? If so, what was its impact and how did you overcome it?

¿En el pasado, tenía otras enfermedades de sus plantas antes de roya? ¿Qué fue el impacto?

How has roya affected your family? What has been the hardest challenge?

¿De que forma cree que le ha afectado la roya a su familia? ¿Cuál sería su reto más grande para salir de esta situación?

Amount of harvest change

¿Cuál fue la diferencia en la cantidad de su cosecha este año?

Qualitative change in lifestyle because of the roya (how much less did you earn?)

¿Cómo cambió su vida porque de la roya? ¿Cuánto le perdió porque de la roya?

Where did you learn all the information you currently know about roya? What else do you hope to learn about roya?

¿De donde aprendió la información que sabe sobre la roya? ¿Que más quiero aprender sobre la roya?

What do you wish to do differently with your farm, if you had the money to do so?

¿Si tuviera dinero, que le gustaría hacer con su finca?

What are some of the hardest choices you had to make this past year?

¿Cuál fueron las decisiones mas difíciles tuvo que hacer in este ano pasado?

Do you feel prepared if another outbreak occurs?

¿Cree que está listo si hay un otro ataque de la roya?

What have you done to counter this issue?

¿Qué ha hecho para combatir la roya?

Have you talked with other farmers to come up with solutions?

¿Ha hablado con otros productores sobre soluciones?

What are your plans for the next few years?

¿Cuál son sus planes para los próximos años?

What would you like to see UMF offer? What resources are you lacking?

¿Qué más le gustaría que UMF ofrece para los productores? ¿Qué tipos de recursos necesita?

How many children do you have? Where do they go to school? How have they been affected?

¿Cuántos niños tiene? ¿En qué escuela están?

What do you hope they achieve / aspire to become one day?

¿Qué espera para sus niños? (trabajos)

What is your biggest fear?

¿Cuál es su temor más grande?

For those who purchase your coffee, what would you like to tell them?

¿Para las personas que compran su café, que le gustaría decir a ellos?

How do you normally drink your coffee? How do you prepare it?

¿Normalmente, bebe café Ud.? ¿Cómo prepara su café?

Do you have any comments/ points you wish to add?

¿Otros comentarios?

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